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| 10/589,589 | 08/16/2006 | Toshihide Sekido | BAN-06-1238 | 2699 |

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| EXAMINER | |
|---|---|
| DYE, ROBERT C | |
| ART UNIT | PAPER NUMBER |
| 1791 | |

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

pto.phil@dlapiper.com

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/589,589 | SEKIDO ET AL. | |
| | Examiner | Art Unit | |
| | ROBERT DYE | 1791 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *13 May 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1,2,5-23,50,51 and 54-85* is/are pending in the application.

4a) Of the above claim(s) *70-85* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,5-23,50,51 and 54-69* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 August 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

1. This is a Final Office action in response to Applicant's reply, dated 5/13/2009, to a non-Final office. Claims 1, 2, 5-23, 50, 51, 54-69 are pending.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1, 5-8, 10-12, 50, 54-57, and 59-62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hettinga (USP 4,743,323) in view of Seemann (USP 5,439,635).

5. Regarding claims 1 and 50, Hettinga teaches a method and apparatus wherein a fibrous substrate is disposed into a mold cavity, the mold cavity is clamped with clamping means 21, and resin is injected into a fibrous substrate via multiple pathways

(see channels in block 18). Hettinga illustrates that in figures 4 and 5 that mold 18 is divided into two parts with an intermediate member containing plural resin paths extending through the thickness direction to permit injection of resin into the fiber substrate from a plurality of positions almost simultaneously.

6. Hettinga does not teach that a discharge groove extends over the circumference of the fiber substrate and is formed on the die or the intermediate member. In the same field of endeavor of resin transfer molding, Seemann teaches the use of resin grooves formed in the molding die and which are disposed about the circumference of the fiber substrate to facilitate the removal of resin (vacuum flow conduit 24) to uniformly draw resin from the supply conduit through the fibrous preform (col 5, 28-31; col 9, lines 3-12). It would have been obvious to a person having ordinary skill in the art at the time the invention was made to provide a discharge groove that extended around the circumference of the preform as taught by Seemann in the mold of Hettinga for the purpose of uniformly drawing the resin through the preform.

7. Regarding placement of the groove in the intermediate member in claims 5 and 54, such is a mere engineering design choice and it would have been obvious to a person having ordinary skill in the art to locate the resin discharge groove on a surface of the intermediate member. With fiber substrate located between the intermediate member and a mold, a person having ordinary skill in the art would recognize that since the both surfaces are in immediate contact with the preform, either surface would be suitable for placement of a groove to draw away excess resin.

8. Regarding claims 6 and 55, Hettinga teaches the presence of a groove formed in between the mold die and intermediate member which acts as a resin distribution channel connecting the resin injection port with the through-channels formed in the intermediate member. While figures 4 and 5 illustrate the intermediate member forming a wall of said groove, Hettinga does not illustrate said groove formed in the intermediate member. However, a person having ordinary skill in the art at the time of the invention would have recognized that said groove could just has easily been formed on the surface of the intermediate member instead of the opposing mold face. It is a mere matter of engineering design choice that the resin distribution groove is formed on the mold face instead of the intermediate member face. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to form the groove on the intermediate member surface for the purpose of ensuring resin distribution from the resin inlet to the resin through paths.

9. Regarding claims 7 and 56, it is well known in the molding art to construct a mold out of metal material. It would have obvious to a person having ordinary skill in the art at the time the invention was made to construct the intermediate member from metal since is have been held to be within the ordinary skill of worker in the art to selected a known material on the basis of its suitability for the intended use. One would have been motivated to use metal for the purpose of constructing the mold from a material with high strength and durability.

10. Regarding claims 8 and 57, Hettinga does not teach that the injection member is nipped and sealed between the intermediate member and a die facing said intermediate

member. However, the location of the resin injection port between the intermediate member and the mold die is an obvious matter of mere engineering design choice for a person having ordinary skill in the art at the time of the injection. Placement of the injection member at such a location would provide benefits for alleviating machining costs of the mold tool or size constraints on the molding device. It would further be obvious to a person having ordinary skill in the art to seal said member in place such that resin leaks would be prevented.

11. Regarding claims 10 and 59, Hettinga illustrates the use of an intermediate member with two through holes to allow resin passage between the mold die and the fibrous preform. The intermediate member can be construed as a plate and further, the presence of multiple holes means it is perforated. Thus the intermediate member of Hettinga can be construed as a perforated plate.

12. Regarding claims 11 and 60, figure 4 further illustrates that the die contacting the intermediate member contains a groove which forms a resin path between the injection port and the through holes.

13. Regarding claims 12 and 61, figure 4 illustrates that a gap is formed between the mold die and the intermediate member (said gap is not limited to the entire surface or specific portions of said surface). Hettinga does explicitly teach the size of said gap; however, given the size of mold cavity and the preform being molded (a seat base), it gap would likely be on the order of a few millimeters. Further, it would have been obvious to a person having ordinary skill in the art at the time of the invention to adjust the gap size to within 1 to 10mm, since such a modification would involve only a mere

change in the size of a component. A person having ordinary skill in the art would be motivated to choosing an appropriate scale of the gap in order to control the desired throughput and pressure drop of resin being supplied via said gap.

14. Regarding claims 16 and 65, wherein gas and excessive resin are discharged intermittently, such would be intrinsic to the mold of Hettinga. As resin infiltrates the preform and gas and excess resin are removed from the cavity, gas bubbles will inherently be released along with excess resin via the outlet. It would be expected that bubbles mixed with resin would be released during the resin infiltration step and thus result in intermittent release of gas and resin.

15. Regarding claims 17 and 66, wherein the flow rate of resin flowing into the mold is controlled by the pressure differential between the injection pressure of the resin and the pressure within the mold; such would be inherent to any resin transfer process. The flow of resin from one cavity (injection port) to a second cavity (mold) would inherently depend on a pressure drop driving the fluid flow. There would inherently be no net resin flow if the pressures are equal (Pm=Pi) and there would be positive flow if the injection pressure is higher than the mold pressure (Pi>Pm).

16. Regarding claim 62, wherein a core material is laminated to said reinforcing substrate, the apparatus of Hettinga is capable of working upon a laminated substrate. Examiner wishes to point out to applicant that claims 51-69 are directed towards an apparatus and as such will be examined under such conditions. The material worked upon or the process of using the apparatus are viewed as recitation of intended use and are given no patentable weight (Please see MPEP 2114 R1-2115 R2 for further details).

17. Claims 2, 9, 51 and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hettinga (USP 4,743,323) in view of Seemann (USP 5,439,635) as applied to claims 1 and 50 above, and further in view of Cushman (USP 5,248,467).

18. Regarding claims 2 and 51, Hettinga does not expressly teach the use of vacuum suction. In the same field of endeavor of resin transfer molding, Cushman teaches a method and apparatus wherein a vacuum suction is applied to the mold cavity for the purpose of removing gasses, adsorbed and chemisorbed water and other substances prior to resin injection (abstract and col 2, lines 14-30) and further use of the vacuum during injection to speed the injection process by reducing internal mold pressure (col 2, lines 7-10). Thus, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to provide a vacuum suction on the mold cavity prior to and during resin injection as taught by Cushman in the method and apparatus of Hettinga for the purpose of evacuating the mold cavity of gasses and speeding up the injection process (abstract).

19. Regarding claims 9 and 58, Hettinga does not disclose a discharge member. In the same field of endeavor of resin transfer molding, Cushman discloses resin discharge members (items 21 and 22, figure 4) which collect resin overflow as it exits the mold cavity. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to incorporate a discharge member as taught by Cushman for collecting the resin overflow (col 9, lines 25-30). Regarding the placement of the discharge member, the location of the resin discharge member between the

intermediate member and the mold die is an obvious matter of mere engineering design choice for a person having ordinary skill in the art at the time of the injection. Placement of the discharge member at such a location would provide benefits for alleviating machining costs of the mold tool or size constraints on the molding device. It would further be obvious to a person having ordinary skill in the art to seal said member in place such that resin leaks would be prevented.

20. Claim 14 and 63 rejected under 35 U.S.C. 103(a) as being unpatentable over Hettinga (USP 4,743,323) in view of Seemann (USP 5,439,635) as applied to claim 3 above, and further in view of Waldrop, III et al. (PGPub 2002/0022422).

21. Regarding claims 14 and 63, as discussed above for claims 8 and 57, it would have been an obvious matter of engineering design choice to choose the location of the resin injection member. Hettinga does not expressly disclose sealing a resin injection tube with an elastic material however. In the same field of endeavor, Waldrop, III et al. (hereinafter Waldrop) disclose a resin transfer device wherein Waldrop teaches that a simplified plumbing system to supply resin and vacuum reduces vacuum leaks and a preferable approach for porting is to deliver resin to the preform with tubes that pass through the rubber seals which seal the vacuum pressure within the mold (paragraph 120). Thus, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to use resin delivery tubes which pass through rubber seals of the vacuum mold as taught by Waldrop in the mold of Hettinga for the purpose of preventing vacuum leaks.

22. Claim 15 and 64 rejected under 35 U.S.C. 103(a) as being unpatentable over Hettinga (USP 4,743,323) in view of Seemann (USP 5,439,635) and Waldrop, III et al. (PGPub 2002/0022422) as applied to claim 14 and 63 above, and further in view of Cundiff et al. (USP 6,560,843).

23. Regarding claims 15 and 64, the combination of Hettinga and Waldrop does not teach an O-ring for sealing the cavity at the parting surfaces. In the same field of endeavor of resin transfer molding, Cundiff et al. (hereinafter Cundiff) teach that one or more peripheral channels (20) are provided in the mold die to form seats for seal rings so as to allow an evacuated or pressurized environment around the mold cavity impressions (col 2, lines 57-61). Thus, it would have been obvious to a person having ordinary skill to use an O-ring to seal the mold cavities as taught by Cundiff in the combination of Hettinga and Waldrop for the purpose of ensuring a pressurized environment within the mold cavity. Regarding the O-ring being incorporated into the elastic material for the seal, Waldrop does teach that tubes a preferably passed through the rubber seals of the cavity; thus the tubes would preferably pass through the O-ring seal of Cundiff.

24. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hettinga (USP 4,743,323) in view of Seemann (USP 5,439,635) as applied to claim 3 above, and further in view of Foster (USP 5,565,162).

25. Regarding claim 13, Hettinga does not teach a method wherein a core material is laminated to the fiber substrate. However, it is well known in the art that resin transfer molding can be used to laminate a fiber substrate to a core material. In the same field of endeavor of resin transfer molding, Foster teaches that multiple layers can be placed within the mold cavity. The introduction of resin into said layers and its subsequent curing would laminate said layers to each other.

26. Claims 18, 19, 67, 68 and 69 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hettinga (USP 4,743,323) in view of Seemann (USP 5,439,635) as applied to claims 16 and 65 above, and further in view of Cushman (USP 5,248,467).

27. Regarding claims 18, 19, 67, 68 and 69, Hettinga does not expressly teach a method or apparatus wherein the resin flow is controlled by controlling the diameter of a discharge port for discharging resin, in particular a valve. In the same field of endeavor of resin transfer molding, Cushman teaches that a valve (16) is opened and closed to control the discharge of resin from the resin injector into the mold cavity (see figure 4). It would have been obvious to a person having ordinary skill in the art at the time the invention was made to use a valve to open/close the resin line as taught by Cushman in the method of Hettinga for the purpose of controlling the resin flow rate with the conventional and well known means to control fluid flow.

28. Regarding claims 19 and 68, the hypothetical combination of Hettinga and Cushman disclose a resin transfer molding apparatus and method with a means to control the discharge of resin into mold cavity. The combination does not teach that the

timing is stored in memory and that the process is automated. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to automate valve opening and closing, since it have been held that broadly providing a mechanical or automatic means to replace a manual activity which accomplishes the same result involves only routine skill in the art. One would have been motivated to automate the valve control of the resin flow rate in order to increase consistency in the filling process and reduce error in the control system. Regarding the timing of the adjustment being stored in memory, such would intrinsically be required for a control system to automatically function.

29. Claims 20-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hettinga (USP 4,743,323) in view of Seemann (USP 5,439,635) as applied to claim 3 above, and further in view of Freitas et al. (USP 5,921,754).

30. Regarding claims 20 and 21, Hettinga does not teach the resin flow rate, the projected area or the pressurizing force. In the same field of endeavor of resin transfer molding of composite material, Freitas et al. (hereinafter Freitas) teaches a method for molding turbine rotors wherein resin is injected at 20ml/min-60ml/min and at a pressure of about 30psi (about 0.2MPa). Freitas does not provide the projected area; however, a 20ml/min-60ml/min flow rate would correlate with a projected area range of $0.033m^2$ to $1.2m^2$ (for claim 20) or 0.01 to 0.6m (for claim 21 using 30psi). One would expect a conventional rotor blade to fall within those areas. It would have been obvious to use the mold conditions of Freitas in the method of Hettinga for the purpose of molding a

diverse set of articles objects such as those of similar in size and construction to the rotor blades of Freitas.

31. Further, it would have been obvious to one having ordinary skill in the art at the time the invention was made to conduct the molding method according to the claimed flow rate, projected area, and pressure, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. One would have been motivated to adjust the flow rate and pressure for the purposes of ensuring sufficient resin infusion in a timely manner while preventing damage to the preform.

32. Regarding claim 22, as stated above, Freitas teaches a pressure of 30psi which is about 0.2MPa.

33. Regarding claim 23, the method for molding the articles of Freitas uses a temperature of about 350F for 2hour to cure the articles. While this temperature and time are slightly higher than the claimed ranges, it is well known in the art to select an appropriate temperature and curing time based on the type of resin used as well as the dimensions of the article. It is well within the skill of a person having ordinary skill in the art to select the claimed curing time and temperature based on the type of resin used and size of the article.

***Response to Arguments***

34. Applicant's arguments filed 5/13/2009 have been fully considered but they are not persuasive.

35. Applicant's arguments are summarized as follows:

a. Hettinga relates to molding employing injection molding and resides in a technical field completely different from the field of RTM molding wherein a part of the injected resin is discharged as excessive resin.

b. Seeman does not provide a description nor suggestion with respect to a concrete structure of the Seeman mold, it would not be obvious to combine Seeman with Hettinga.

36. Regarding the first argument, Hettinga discloses an apparatus and method for injecting resin into a fibrous preform, thus it is considered to be a resin transfer molding process. The discharge of excessive resin, typically described as flash, is a well-known occurrence in injection molding processes and can be desirable in order to ensure complete filling of a mold cavity.

37. Regarding the second argument, Seeman teaches that a channel in a circumferential relationship to the preform can be provided to promote the uniform filling of the preform with the resin. Seeman provides guidance on the placement of the conduit in that it forms a continuous ring about the preform (see fig. 2; placed around the perimeter of the article, col 5, line 30-31). While Seeman does not explicitly teach how the structure of such a channel should be implemented in a mold such as that of Hettinga, such is a mere matter of engineering design choice which a person having ordinary skill in the art at the time of the invention could decide according to desired resin flow based on the perform and mold cavity construction.

***Conclusion***

38. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERT DYE whose telephone number is (571)270-7059. The examiner can normally be reached on Monday to Friday 8:00AM to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph S. Del Sole can be reached on (571)272-1130. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

RCD

/Joseph S. Del Sole/

Supervisory Patent Examiner, Art Unit 1791